

## **TITLE OF THE INVENTION**

# MONITOR CASE COMPRISING FACILE DETACH STRUCTURE

## CLAIM OF PRIORITY

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application entitled *Assembling Structure of Monitor Case* earlier filed in the Korean Industrial Property Office on 13 February 1999, and there duly assigned Serial No.99-5277 by that Office and an application entitled *Assembling Structure of Monitor Case* earlier filed in the Korean Industrial Property Office on 13 February 1999, and there duly assigned Serial No.99-5285 by that Office.

## BACKGROUND OF THE INVENTION

## Field of the Invention

The present invention relates to a monitor, and in particular to a monitor having a detachable engaging structure adapted to a monitor casing formed of a front casing stably engaging to a rear casing.

## Description of the Background Art

Generally, a monitor is capable of emitting an electron beam from an electron gun of a cathode ray tube toward a fluorescent material coated on the cathode ray tube based on an image signal for generating different bright and color lights, so that it is possible to form a certain character, symbol, graphic, or other visual display.

The monitor includes a casing for protecting the inner structure including components such as the cathode ray tube (CRT), CRT control circuits, and power supplies from an external impact. The casing is formed of a front casing and a rear casing that are engaged by fasteners such as screws.

In the conventional engaging structure of the monitor casing, when engaging the rear casing to the front casing, the engaging positions of the screw and the hole must be accurately aligned, so that accurate work is required. In addition, during the engaging process, the front and rear casings must be manually engaged using a certain tool, so that the entire assembling process takes a long time. In addition, since the assembling and disassembling processes are repeatedly performed, the hole for the screw may be enlarged, so that it is impossible to implement a stable engagement between the front casing and the rear casing of the monitor.

An exemplar of the art, Helgeland (U.S. Patent 4,662,797, *Adaptable Housing for a Video Terminal*, May 5, 1987) discloses fasteners such as screws to attach the front casing with the rear casing. Other exemplar art are Douken et al. (U.S. Patent 5,793,494, *CRT Display Device*, August 11, 1998), Lundgren et al. (U.S. Patent 5,870,485, *Computer Visual Display Monitor with Integral Stereo Speaker and Directional Microphone and Method for Construction*, February 9, 1999), Fazioli (U.S. Patent 4,651,218, *Method and Apparatus for Mounting a CRT in a Dynamic (Vibration and Shock Prone) Environment*, March 17, 1987), Leo et al. (U.S. Patent 5,084,757, *Method and Apparatus for Mounting a Cathode Ray Tube to Minimize Tube Shift and Respect to a Bezel*, January 28, 1992), and Lo (U.S. Patent 5,122,928, *Monitor Housing*, June 16, 1992).

## SUMMARY OF THE INVENTION

It is therefore, an object of the present invention to provide a monitor casing capable of

1 significantly decreasing the assembly time by having an easier assembling and disassembling  
2 operation of the front and rear casing.

3 It is another object to enhance the engaging state of the monitor.

4 It is a further object to avoid damage to the monitor housing while assembling and  
5 disassembling the monitor case multiple times.

6 It is yet another object to need less precision in assembling the monitor housing.

7 It is still a further object to allow easy and quick access to the internal parts of a monitor.

8 To achieve the above objects, there is provided a monitor having a cathode ray tube encased  
9 within a housing formed by engaging the front casing with a rear casing. The front casing has at least  
10 one snap portion at the upper rear surface and at least one engaging pin at the lower rear. A rear  
11 casing has at least one engaging portion at an upper front surface that detachably engages with the  
12 front casing. At least one receiving hole is formed at a lower portion of the front surface, so that the  
13 rear casing is integrally engaged with the front casing in such a manner that the receiving hole is  
14 separately engaged to the engaging pin, and a snap pin engaged in the receiving hole for preventing  
15 the engaging pin from disconnecting from the receiving hole in the case that the engaging pin of the  
16 front casing is integrally engaged into the receiving hole of the rear casing.

17 The snap portion has an elastic plate formed by cutting away a part of the inner structure of  
18 the snap portion, a rectangular engaging hole formed at an intermediate portion of the elastic plate  
19 and a slant surface formed at one end of the snap portion at a certain angle. The engaging portion  
20 includes an engaging shoulder portion fixed by an engaging hole of the snap portion and a pair of  
21 guides formed in both directions of the engaging shoulder portion, thus allowing the engaging  
22 portion to be stably engaged with the snap portion.

1        The distance between the guides is larger than the width of the snap portion, and both sides  
2        of the snap portion contact with the inner surfaces of the guides. The heights of the guides are lower  
3        than the height of the engaging shoulder portion, and the lengths of the guides are shorter than the  
4        length of the engaging shoulder portion. When the front and rear casing are integrally engaged, a  
5        certain gap is formed between the front and rear casings, so that a certain tool such as a driver is  
6        inserted into the gap when disassembling the front and rear casings.

7        The engaging pin is a rectangular bar, and a pair of reinforcing shoulder portions are formed  
8        at the upper end of the engaging pin, and an engaging portion is formed at an end portion of the  
9        lower surface of the engaging pin. A cut-away groove is formed at the top portion of the receiving  
10      hole, and a fixing hole is formed at a portion backwardly distanced from the cut-away portion, and  
11      a pair of engaging shoulder portions each having a slant surface are formed at the bottom portion,  
12      and the engaging portion of the engaging pin is engaged and disconnected with the engaging  
13      shoulder portions.

14      The snap pin includes a polygonal upper body, a lower body formed at a lower portion of the  
15      upper body and having one end divided into first and second members, and a connection portion for  
16      integrally connecting the upper and lower bodies. An engaging protrusion is downwardly protruding  
17      from one end of the upper body and is fixed at a fixing hole of the top portion. The width of the  
18      lower body is smaller than the distance between the reinforcing shoulder portions and is received  
19      between the reinforcing shoulder portions when the first and second members are aligned in the  
20      center direction of the shoulder portions.

21      Additional advantages, objects and features of the invention will become more apparent from  
22      the description which follows.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

A more complete appreciation of this invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

Figure 1 is a disassembled perspective view illustrating an engaging structure of a monitor casing;

Figure 2 is an enlarged cross-sectional view illustrating upper and lower engaging structures of a monitor casing;

Figure 3 is a disassembled perspective view illustrating an engaging structure of a monitor casing according to the present invention;

Figure 4 is a perspective view illustrating an upper engaging structure of a front casing and a rear casing of a monitor according to the present invention;

Figures 5A - 5C illustrate an engaged state of the upper portions of a front casing and a rear casing of Figure 4;

Figure 6 is a perspective view illustrating the portion C of Figure 3;

Figure 7 is a perspective view illustrating the portion D of Figure 3;

Figure 8 is a cross-sectional view illustrating a lower engaging portion of a front casing and a rear casing according to the present invention;

Figure 9 is an enlarged cross-sectional view illustrating the portion F of Figure 8; and

Figure 10 is a cross-sectional view taken along line E-E of Figure 9.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1           Turning now to the drawings of figures 1 and 2, the monitor 1 includes a front casing 2, a  
2           cathode ray tube 3 engaged to the back of the front casing 2, and a rear casing 4 integrally engaged  
3           with the front casing 2. A receiving groove 8 is formed at each corner portion of the back of a rim  
4           portion 6. In addition, a through hole 9 through which an engaging screw 7 passes is formed at each  
5           corner portion of the rear casing 4.

6           The engaging screw 7 is engaged into the receiving groove 8 of the front casing through the  
7           hole 9 of the rear casing 5, so that the front and rear casings 2 and 4 are integrally engaged. When  
8           disassembling the front and rear casings 2 and 4, the engaging screw 7 is loosened using a certain  
9           tool such as a driver or other similar tools.

10           Referring to figure 3, a monitor 50 includes a front casing 51, a cathode ray tube 52 engaged  
11           to the back of the front casing 51, and a rear casing 53 integrally engaged with the front casing 51  
12           for protecting the inner elements of the monitor from an external impact.

13           A plurality of snap portions (or indent portions) 60 are backwardly protruded from the upper  
14           portion of the back of the front casing 51. In addition, a plurality of engaging portions 70(Figure 4)  
15           are formed at the front upper portion of the rear casing 53. Therefore, the engaging portions 70 are  
16           engaged to the snap portions 60, so that the front casing 51 and rear casing 53 are integrally engaged.  
17

18           In addition, an engaging pin 80 is protruding from both rear lower portions of a rim portion  
19           of the front casing 51. A receiving hole 90 (figure 7) is formed at both front lower portions of the  
20           rear casing 53. Therefore, since the engaging pin 80 is engaged into the receiving hole 90, the lower  
21           portions of the front and rear casings, 51 and 53 respectively, are engaged. In addition, since the snap  
22           pin 100 is inserted into the receiving hole 90, the front casing 51 is not easily disassembled from the

1 rear casing 53.

2 The snap portions and the engaging portions are explained in more detail with reference to  
3 Figures 4 and 5A through 5C. As shown therein, the snap portion 60 is backwardly protruding from  
4 the lower surface of the upper rim portion 56 of the front casing 51. The snap portion 60 is formed  
5 of a rectangular plate having a certain length and an elastic material. Three inner corner portions of  
6 the snap portion 60 are cut away, so that an elastic plate 62 having a proper elastic force is formed.  
7 In addition, a rectangular engaging hole 63 is formed at an intermediate portion of the elastic plate  
8 62. A slant surface 64 having a certain slant angle is formed at one end of the snap portion 60.

9 In addition, the engaging portion 70 of the rear casing 53 is formed at a lower surface of the  
10 upper rim portion 57 of the rear casing 53 to correspond with the snap portion 60 of the front casing  
11 51. The engaging portion 70 has an engaging shoulder portion 73 at an intermediate portion of the  
12 same, and a pair of guides 74 are formed at both sides of the engaging shoulder portion 73.

13 The front portion 71 of the engaging shoulder portion 73 is circular, and a vertical wall is  
14 formed at the rear surface portion 72, so that the engaging shoulder portion 73 slides on the slant  
15 surface 64 and is engaged to the engaging hole 63.

16 The length L1 of each of the guides 74 is longer than the length L2 of the engaging shoulder  
17 portion 73. In addition, the distance D1 between the guides 74 is larger than the length D2 in the  
18 direction of the width of the snap portion 60. Therefore, when the snap portion 60 is engaged to the  
19 engaging portion 70, the end portions of the guides 74 contact first with the outer surface of the snap  
20 portion 60, so that the engaging shoulder portion 73 is accurately engaged to the engaging hole 63  
21 of the snap portion 60.

22 As shown in Figure 5B, when the snap portion 60 and the engaging portion 70 are integrally

1 engaged, a gap 58a is formed between the front and rear casings 51 and 53 respectively. A certain  
2 manual tool is inserted into the gap 58a when disassembling the front and rear casings, 51 and 53  
3 respectively. When fabricating the snap portion 60 and the engaging portion 70, the size of the gap  
4 58a is determined.

5 The engaging structure of the lower portions of the front and rear casings is explained with  
6 reference to Figures 6 and 7. As shown therein, an engaging pin 80 is backwardly protruding from  
7 both rim portions 56 (on the left and right side) of the rear surface of the lower portion of the front  
8 casing 51. The engaging pin 80 is formed of a rectangular bar having a certain size. A pair of  
9 reinforcing shoulder portions 81 are formed at the upper portion of the engaging pin 80. An engaging  
10 portion (or detent) 82 is formed at a lower end portion of the engaging pin 80.

11 A pair of the reinforcing shoulder portions 81 are protruded from both upper surface portions  
12 of the engaging pin 80 and have a certain height. The reinforcing shoulder portions 81 are distanced  
13 by a predetermined distance  $t_1$ .

14 A receiving hole 90 of the rear casing 53 is formed at both sides of the front lower portion  
15 54 of the rear casing 53. The receiving hole 90 is rectangular and is extended backwardly by a  
16 certain distance and is accessible to the outside of the rear casing 53. A pair of engaging shoulder  
17 portions 92 are formed at both sides of a bottom portion 91 of the receiving hole 90. Since the  
18 engaging shoulder portions 92 have a slant surface, the rear portions of the engaging shoulder  
19 portions 92 are higher than the front portions of the same. Therefore, the engaging portion 82 of the  
20 engaging pin 80 of the front casing 51 slides backwardly along the slant surface 93 of the engaging  
21 shoulder portions 92 and is engaged with the engaging shoulder portions 92.

22 An engaging groove 94 cut-away in a step shape is formed at the top portion 95 of the

1 receiving hole 90. A rectangular fixing hole 96 is formed through the top portion 95 of the receiving  
2 hole 90 at a certain distance from the engaging groove 94.

3 When the engaging pin 80 is engaged to the engaging shoulder portions 92 of the receiving  
4 hole 90, a user upwardly pushes the engaging pin 80, so that it is possible to manually separate  
5 without using a certain tool such as a driver. While the user is using the monitor 50, the lower  
6 portion of the casing may be opened. In order to prevent the above-described problem, a snap pin  
7 100 is formed.

8 The snap pin is explained in more detail with reference to Figures 7, 9 and 10. As shown  
9 therein, a snap pin 100 includes an upper body 101, a lower body 103 formed at a lower portion of  
10 the upper body 101, and a connection portion 102 for integrally connecting the upper and lower  
11 bodies 101 and 103.

12 The upper body 101 is formed of a polygonal plate and has a front portion integrally  
13 connected with the connection portion 102, and a protrusion (or detent) 106 is downwardly formed  
14 at the bottom of the end portion of the upper body 101.

15 The lower body 103 has a front end portion integrally connected with the connection portion  
16 102. The end portion of the lower body 103 is formed in a V-shape separated into first and second  
17 members 104 and 105 respectively. The first and second members 104 and 105 are formed of an  
18 elastic force material and may be transformed in the arrow direction 107 in the drawings. In addition,  
19 the protrusions (or detents) 104a and 105a are downwardly projecting from the lower surface of the  
20 end portions of the first member 104 and second member 105 respectively. The upper and lower  
21 bodies 101 and 103 are integrally connected by the connection portion 102 having a certain height,  
22 and a certain space is formed between the upper and lower bodies 101 and 103.

1 In the case that the snap pin 100 is engaged into the receiving hole 90, the top portion 95 of  
2 the receiving hole 90 is inserted into the space. In addition, a protrusion 106 of the upper body 101  
3 slides on the upper surface of the top portion 95 of the receiving hole 90 and is engaged with the  
4 fixing hole 96. Therefore, the snap pin 100 is engaged with the top portion 95 of the receiving hole  
5 90.

6 Referring to Figure 10, the width  $t_2$  of the lower body 103 is smaller than the distance  $t_1$  of  
7 the reinforcing shoulder portion 81 of the engaging pin 80. The distance  $t_3$  between the first member  
8 104 and second member 105 is smaller than the distance  $t_1$  when the first member 104 and second  
9 member 105 of the lower body 103 are ~~aligned in the arrow direction 107~~ <sup>deformed in the direction opposite to the arrow 107</sup> and are received between  
10 the reinforcing shoulder portions 81 of the engaging pin 80. On the other hand, in the case that the  
11 first and second members 104 and 105 are widened in the arrow direction 107, the distance  $t_3$   
12 between the first and second members 104 and 105 is larger than the distance  $t_1$  of the reinforcing  
13 shoulder portions 81, so that the first and second members 104 and 105 are not received between the  
14 reinforcing shoulder portions 81, namely, are positioned at the top of the reinforcing shoulder portion  
15 81.

16 Therefore, the snap pin 100 is positioned between the engaging pin 80 and the top portion  
17 95 of the receiving hole 90, so that it is possible to prevent the engaging pin 80 from escaping from  
18 the engaging shoulder portion 92 of the receiving hole 90. The engaging operation of the monitor  
19 according to the present invention will be explained with reference to the accompanying drawings.  
20 As shown in Figures 4, 5A and 5B, in the case that the rear casing 53 is engaged to the front casing  
21 51 by a user, the engaging portion 70 of the rear casing 53 is aligned at the engaging position with  
22 respect to the snap portion 60 of the front casing 51. In addition, the rear casing 53 is pushed in the

1       arrow direction 66, so that the snap portion 60 is positioned between the guides 74.

2       When the inner surfaces 76 of the guides 74 contact with the outer surface 65 of the snap  
3       portion 60, the guides 74 guide so that the engaging shoulder portion 73 is accurately fixed by the  
4       snap portion 60.

5       When the engaging shoulder portion 73 contacts with the slant portion 64 of the snap portion  
6       60, the front surface of the engaging shoulder portion 73 slides along the slant surface 64. At this  
7       time, the elastic plate 62 of the snap portion 60 downwardly moves. Therefore, the engaging  
8       shoulder portion 73 is inserted into the engaging hole 63 formed at the snap portion 60 beyond the  
9       slant surface 64, so that the upper portions of the front and rear casings 51 and 53 are integrally  
10      engaged.

11      As shown in Figures 4, 5B and 5C, the case that the rear casing 53 is separated from the front  
12      casing 51 will be explained. First, a certain tool such as a driver 58 is inserted into the gap 58a  
13      formed between the front casing 51 and the rear casing 53. In addition, the driver 58 is pushed in the  
14      arrow direction 58b, so that the end portion 58c of the driver 58 contacts with the upper surface of  
15      the elastic plate 62 and downwardly pushes the elastic plate 62. In addition, the engaging plate 73  
16      escapes from the engaging hole 63 of the elastic plate 62 by backwardly moving the rear casing 53.

17      Therefore, the engaging shoulder portion 73 slides along the slant surface 64 of the snap  
18      portion 60 and is separated from the snap portion 60. As a result, the upper engaged portions of the  
19      front and rear casings 51 and 53 are separated from each other.

20      The upper engaging portions of a first side are separated, and the upper engaging portions  
21      of a second side are separated. Since the upper engaging structure of the second side is the same as  
22      the first side, the separation process is the same.

1        While the upper engaging portions of the second side are being separated, the separated upper  
2        engaging portions of the first side may be engaged again. In the upper engaging structure of the  
3        monitor 50, however, the engaging shoulder portion 73 is backwardly pushed by the length of the  
4        slant surface 64 and is detached from the snap portion 60. Therefore, it is possible to prevent a re-  
5        engagement at the upper engaging structure of one side.

6        The lower engagement of the monitor is explained with reference to Figures 7, 9 and 10. As  
7        shown therein, in the case that the user engages the rear casing 53 to the front casing 51, the snap  
8        pin 100 is engaged into the receiving hole 90 of the rear casing 53. Namely, the first member 104  
9        and second member 105 of the snap pin 100 are aligned in the direction of the cut-away groove 96  
10       formed at the top portion 95 of the receiving hole 90, and the snap pin 100 is pushed by an external  
11       force. Therefore, the snap pin 100 is moved by an external force, and the protrusion 106 is  
12       backwardly moved along the upper surface of the top portion 95 of the receiving hole 90 and is  
13       engaged into the fixing hole 96.

14       At this time, the top portion 95 of the receiving hole 90 is positioned in a certain space  
15       formed by the upper body 101 and lower body 103. When the snap pin 100 is fixed in the receiving  
16       hole 90, the first member 104 and second member 105 pass through the receiving hole 90 and are  
17       protruding to the outside of the receiving hole 90.

18       At this time, the first member 104 and second member 105 are widened in the arrow direction  
19       107. In addition, since a certain distance is maintained between the lower body 103 of the snap pin  
20       100 and the bottom portion 91 of the receiving hole 90, the engaging pin 80 is inserted.

21       After the snap pin 100 is engaged into the receiving hole 90, the user aligns the front casing  
22       51 and the rear casing 53 at an engaging position. In addition, the front casing 51 is backwardly

1 moved, so that the engaging pin 80 is inserted into the receiving hole 90 of the rear casing 53. When  
2 the engaging pin 80 is inserted into the receiving hole 90, the engaging portion 82 of the engaging  
3 pin 80 contacts with the upper surfaces 93 of the engaging shoulder portions 92 of the receiving hole  
4 90.

5 Therefore, the engaging portion 82 of the engaging pin 80 is engaged by the engaging  
6 shoulder portions 92, so that the lower portions of the front casing 51 and the rear casing 53 are  
7 integrally engaged. At this time, since an end portion of the engaging pin 80 is exposed to the outside  
8 of the lower surface of the rear casing 53, a user can disassemble using a certain tool such as a driver.

9 In the case that the lower portions of the front and rear casings 51 and 53 are separated, the  
10 user aligns the first member 104 and second member 105 of the snap pin 100 exposed to the outside  
11 of the lower surface of the rear casing 53 in the arrow direction 107. At this time, since the width  $t_2$   
12 of the lower body 103 of the snap pin 100 is smaller than the distance  $t_1$  of the reinforcing shoulder  
13 portion 81 of the engaging pin 80, the snap pin 100 is received between the reinforcing shoulder  
14 portions 81. Therefore, since a certain space by which the engaging pin 80 is upwardly moved is  
15 formed, the engaging pin 80 is upwardly moved by a certain distance.

16 After the engaging pin 80 is upwardly moved by a certain distance, the user upwardly pushes  
17 the lower portion of the engaging pin 80 in the arrow direction 59, so that the engaging portion 82  
18 of the engaging pin 80 is separated from the engaging shoulder portion 92 of the receiving hole 90.  
19 After the engaging pin 80 is separated from the receiving hole 90, the front casing 51 is forwardly  
20 moved by a certain distance, so that it is possible to separate the front casing 51 and the rear casing  
21 53. After one side of the monitor is separated, the engaging portions of the other side may be  
22 separated in the same manner.

1 As described above, in the casing upper engaging structure of the monitor according to the  
2 present invention, an assembling process is simple, and the assembling time is decreased. In  
3 addition, the slant surface of the end portion of the snap portion has a certain length, so that it is  
4 possible to prevent a re-engagement of the upper portion of the other side while the upper engaging  
5 structure is separated. In the monitor casing according to the present invention, a certain tool such  
6 as a driver is not used based on the lower engaging structure of the snap method. It is possible to  
7 assemble and disassemble based on a decreased process, so that the assembling and disassembling  
8 time are decreased. In order to prevent the casing lower engaging structure of the monitor from being  
9 easily separated by an external impact, the snap pin is used, so that it is possible to prevent the front  
10 and rear casing from being randomly separated.

11 Although the preferred embodiment of the present invention have been disclosed for  
12 illustrative purposes, those skilled in the art will appreciate that various modifications, additions and  
13 substitutions are possible, without departing from the scope and spirit of the invention as recited in  
14 the accompanying claims.